KANSAS IMPLEMENTATION PROCEDURES

Wastewater Permitting

Prepared by The Kansas Department of Health and Environment

Bureau of Water

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These written procedures provide a uniform mechanism for drafting National Pollutant Discharge Elimination System (NPDES) permits and Kansas Water Pollution Control permits to meet State and Federal laws and regulations.

The Permitting Process

The discharge of pollutants from point sources to waters of the state is controlled via the issuance of discharge permits. These permits are referred to as Kansas Water Pollution Control Permits or National Pollutant Discharge Elimination System (NPDES) permits. These permits are issued jointly by KDHE and the Environmental Protection Agency. Wastewater permits for treatment facilities that do not discharge to surface waters of the state are referred to as non-overflowing, or non-Q facilities. These permits are issued solely by KDHE. Both discharge and non-overflowing permits are issued under the authority of K.S.A. 65-164 *et se*q. While discharge permits carry pollutant limitations on the effluent, non-overflowing permits do not, as there is not routine, ongoing discharge. Both types of permits may include schedules of compliance and special conditions to prevent, or eliminate pollution.

Permit limits for the discharge of effluent are based on meeting technology-based limits, water-quality criteria, or on best professional judgement (BPJ). Limits are imposed to protect existing uses, achieve designated uses, and limit degradation of existing quality of the waters of the state. KDHE issues both General and Individual permits. General permits are developed to address particular categories of discharges with similar characteristics. Because the discharges have similar characteristics, they require the same effluent limitations, and permit conditions and sampling regimes.

General permits reduce paperwork and permit issuance time due to the fact the general permit is placed on public notice one time. Once the general permit becomes final, an entity files a notice of intent (NOI) to discharge. If the applicant qualifies, the permit is issued without further public notice, with the previously approved conditions.

General permits are utilized by KDHE for the following categories of discharges: Stormwater, Hydrostatic Test Discharges from Pipelines and Storage Tanks Exposed to Crude or Refined Petroleum Products or Liquified Petroleum Gasses, and Non-Overflowing Wastewater Treatment Systems for Hydrodemolition/Hydroblasting Projects.

For discharges not covered by general permits, individual permits must be developed as follows:

I. Development of Effluent Discharge Limitations

Development of effluent limitations involves a hierarchical process. The first step in the process involves the application of a minimum level of treatment for suspected pollutants or categories of pollutants. These limitations are established for certain categorical industries through effluent guidelines promulgated by EPA in 40 CFR Part 400, Subchapter N. The minimum level of treatment for municipal facilities is referred to as secondary treatment and is promulgated by EPA in 40 CFR, Part 133.

The second step in the process involves comparison of the technology-based limit from the first step to water quality based effluent limitations (WQBELs), or limitations established through a total maximum daily load (TMDL). The WQBELs are derived from application of the Kansas Surface Water Quality Standards (KWQS) and standards promulgated by EPA for the State of Kansas. The more stringent of the technology-based limitation, the WQBEL, or the TMDL limitation is used in the permit.

In those cases where there are no technology-based standards, or applicable water quality criteria, BPJ may be used in establishing permit limitations.

Kansas Statutes and Regulations essentially adopt the 40 CFR Part 125 permitting requirements. In general, the Federal regulations require that technology-based treatment requirements under section 301(b) of the Act represent the minimum level of control that must be imposed in a permit issued under section 402 of the Act.

A. Effluent Guidelines - Categorical Industrial Facilities

K.A.R. 28-16-57a adopts by reference 40 CFR Parts 405-436, 439, 440, 443, 446, 447, 454, 455, 457-461, 463, 465, and 469 Effluent Guidelines as in effect on July 1, 1985. This regulation prescribes effluent limitations guidelines for existing sources, standards of performance for new sources and pretreatment standards for new and existing sources pursuant to the Clean Water Act. The effluent guidelines include the following point source categories:

Asbestos manufacturing	Metal finishing
Battery manufacturing	Metal molding and casting
Builders' paper and board mills	Mineral mining and processing
Canned/preserved fruits/vegetables processing	Nonferrous metals manufacturing
Canned and preserved seafood processing	Oil and gas extraction
Carbon black manufacturing	Ore mining and dressing
Cement manufacturing	Organic chemicals

	manufacturing
Coal mining	Plastics and synthetics
Coil coating	Paint formulating
Dairy products processing	Paving and roofing materials
Electroplating	Pesticide chemicals
Electrical and electronic components	Petroleum refining
Explosives manufacturing	Pharmaceutical manufacturing
Feedlots	Phosphate manufacturing
Ferro alloy manufacturing	Photographic
Fertilizer manufacturing	Plastics molding and forming
Glass manufacturing	Pulp, paper, and paperboard
Grain mills	Rubber manufacturing
Gum and wood chemicals manufacturing	Soap and detergent manufacturing
Hospital	Steam electric power generating
Ink formulating	Sugar processing
Inorganic chemical manufacturing	Textile mills
Iron and steel manufacturing	Timber products processing
Leather tanning and finishing	

Most effluent guidelines are based on production rates. To calculate permit limits, effluent guideline values are multiplied by the facility's production rate. Consideration has to be given as to whether production rates will remain constant over the life of the permit. If not, tiered permit limits based on projected production levels may have to be incorporated into the permit.

B. Secondary Treatment Requirements - Municipal/Commercial Facilities

1. Mechanical Plants

a. Secondary treatment will be considered as a monthly average not to exceed 30 mg/l BOD_5 and 30 mg/l TSS. Secondary treatment also requires a pH value of 6.0 to 9.0, unless, a permittee demonstrates that inorganic chemicals are not added to the waste stream as a part of the treatment process, and that industrial sources do not cause the pH of the effluent to be less than 6.0 or greater than 9.0. A $CBOD_5$ of 5 mg/l less than the BOD_5 limit is considered to be equivalent to a BOD_5.

b. For trickling filters, secondary treatment will be considered as a monthly average not to exceed 45 mg/l BOD_5 and 45 mg/l TSS. Secondary treatment also requires a pH value 6.0 to 9.0, unless, a permittee demonstrates that inorganic chemicals are not added to the waste stream as a part of the treatment process, and that industrial sources do not cause the pH of the effluent to be less than 6.0 or greater than 9.0. A $CBOD_5$ of 5 mg/l less than the BOD_5 limit is considered to be equivalent to a BOD_5.

2. Lagoon Systems

Secondary treatment will be considered as a monthly average of 30 mg/l BOD_5 (or 25 mg/l $CBOD_5$) and 80 mg/l TSS where treatment is solely provided by lagoons. *(See Appendix* A).

If a lagoon system is designed to KDHE Minimum Standards of Design - three or more cells and 120-day detention or two cells and 150-day detention - the lagoon system permit will contain a requirement for annual monitoring of ammonia and fecal coliform bacteria. A study conducted by KDHE indicates that lagoon systems treating domestic strength wastewater and meeting the KDHE design criteria consistently produce effluent that meets or exceeds the criteria for ammonia and primary contact recreation (A monthly geometric mean of 200 fecal coliform colonies/100ml) at the discharge pipe prior to mixing. Additionally, data provided by EPA Region VII indicates that 120-day detention lagoons will remove fecal coliform bacteria to less than one colony/100ml, or 200 times less than the primary contact recreation criteria. Therefore, monitoring will provide trend data indicating the point at which a lagoon system is beginning to fail.

Monitoring for ammonia and fecal coliform bacteria is also consistent with EPA Region VII permits issued on tribal lands in Kansas. Other EPA Regions do not require limitations for either fecal coliform or ammonia.

If a lagoon system does not meet with KDHE's minimum standards of design, permit limits will be developed for ammonia and fecal coliform bacteria using the factors described in this section.

BOD_5 limits of 30 mg/l will also be established for lagoon systems meeting the KDHE design criteria. A study conducted by KDHE indicated that lagoon systems treating domestic strength wastewater and meeting the KDHE design criteria consistently discharge soluble BOD_5 at less than 10 mg/l. Lagoons, by nature, generate algae. Due to algae in the lagoon system effluent, EPA has approved total suspended solids limits of 80 mg/l on a monthly average in Kansas. In other states, the monthly average limit is even higher. Algae also exert an oxygen demand in the BOD test due to the fact BOD incubators are devoid of light. Without light, algae do not produce oxygen via photosynthesis. In the open environment of a surface water, algae would be exposed to sunlight and would produce oxygen to at least partially offset oxygen demand. Streeter and Phelps acknowledged this phenomenon in their classic model used to predict oxygen demand. They were unable, however, to quantify the oxygen production. Furthermore, since algae remain living organisms in the effluent that produce oxygen as well as demand oxygen, the exertion of maximum BOD (thus dissolved oxygen sag) typically will not occur at the same location in a receiving water as it will for soluble BOD. Finally, there is a lack of any monitoring evidence that discharge from properly designed lagoon systems have caused in-stream biological impacts due to dissolved oxygen depletion.

Therefore, based on facts that algae 1) algae add oxygen to a receiving water during daylight hours; 2) maximum oxygen demand occurs at a location in the receiving water that is different from maximum oxygen demand exerted by soluble oxygen; and 3) there is a lack of monitoring data tying discharge from properly designed lagoons to in-stream biological impacts, technology-based 30 mg/l BOD_5 limit will be used for lagoon systems that meet the KDHE design criteria.

C. Water Quality Based Effluent Limits (WQBELs) - Municipal and Industrial Facilities

Any discharge to waters of the state must meet limits that assure the Kansas Surface Water Quality Standards (KWQS) and EPA-promulgated standards will be met *(See Appendix B*). The only exception is in the case of a variance being granted based on widespread socioeconomic impacts. The KWQS consist of definitions, classification of streams, use designations, narrative criteria, and numerical criteria. Desktop modeling is utilized to develop permit effluent limitations that assure compliance with the KWQS. Inputs into the modeling process include the following items:

1. Upstream Water Quantity

a. Seven-Day Ten Year Stream Flow (7Q10)
Alternate Low Flow
Applicable Regulations: 28-16-28b(b)
28-16-28b (aaa)
28-16-28c(b)(3)
28-16-28c(b)(7)-(11)
28-16-28c(c)(1)
28-16-28e(c)

The critical low flow utilized by KDHE to determine WQBELs is the hydrologically-based 7Q10 flow, or a scientifically-based alternate. Whenever possible, KDHE will assign a 7Q10 flow to a receiving stream on the basis of United States Geological Survey (USGS) stream flow gaging data. KDHE may, at its discretion, modify the assigned 7Q10 value to reflect gains or losses in flow occurring between the discharge of interest and the reference (nearest upstream or downstream) USGS gaging station. In the determination, KDHE may exclude stream flow data measured prior to construction of upstream flow control structures and exclude stream flow data measured prior to guaranteed stream flow rates based on water assurance district agreements. KDHE may also exclude data not representative of current flow conditions (i.e., increased interstate flows). For streams lacking an adequate USGS database, other sources of hydrological data (e.g., runoff yield maps or KDHE stream flow gaging data) may be used by KDHE in the estimation of 7Q10 flow.

As per K.A.R. 28-16-28e(c), the numeric criteria in tables 1a, 1b, 1c, 1d, 1e, 1g, 1i, and 1j of K.A.R. 28-16-28g(a) shall not apply when:

i. stream flow is less than 0.03 cubic meters per second (1 cubic foot per second) for waters designated as expected aquatic life or restricted aquatic life use; or

ii. stream flow is less than 0.003 cubic meters per second (0.1 cubic feet per second) for waters designated as special aquatic life use.

Therefore, for streams designated for expected or restricted aquatic life use, and have a critical low flow less than 0.03 cubic meters per second, permit limits will be developed based on meeting numeric criteria at such times the critical low flows are at, or above 0.03 cubic meters per second. Similarly, for streams designated for special aquatic life use, and have a critical low flow less than 0.003 cubic meters per second, permit limits will be developed based on meeting numeric criteria at such times the critical low flows are at, or above 0.003 cubic meters per second.

Regardless of flow, the Department reserves the right to set permit limits which will be protective of downstream designated uses.

b. Alternate Low Flow
Applicable Regulations: 28-16-28b (b)
28-16-28c(b)(9)

An alternate low flow must have a sound basis for its use. Examples include water assurance district guaranteed minimum low flows or flow based on allowable exposure frequencies and durations for species of concern. For instance, the most current available study on ammonia toxicity (EPA 1999) recommends utilizing a 30-day exposure period when determining ammonia limitations. Therefore, a thirty-day, ten-year (30Q10) critical low flow will be used in determining ammonia limitations for the chronic ammonia criterion.

2. Pollutant Parameters

Effluent limitations are determined for those parameters the permittee identifies, or the permit writer believes have a reasonable potential to be found in the discharge in concentrations, which exceed the KWQS criteria. Background stream concentrations are derived from instream data collected through the KDHE stream water monitoring network. Otherwise, background concentrations are extrapolated from the network data.

3. Reasonable Potential
Applicable regulation: K.A.R. 28-16-28e

Reasonable Potential means the effluent from the facility normally does not exceed the WQBELs placed in the permit but because of variations in the effluent due to influent and treatment variability, it has a potential to do so.

KDHE uses the attached Reasonable Potential procedure developed by EPA Region VI. *(See Appendix C)*

4. Mixing Zones

a. Streams
Applicable Regulations: 28-16-28c(b)

In cases where the ratio of the receiving stream low flow to effluent discharge design flow listed on the permit is less than 3:1, the default mixing zone consists of 100% of the stream flow and a length of 300 meters. Chronic aquatic life criteria and all other criteria must be met at this point with the exception of drinking water criteria, which must be met at the point of diversion. Where the ratio of the receiving stream low flow to effluent discharge design flow listed on the permit is greater than or equal to 3:1, the default mixing zone is 300 meters in length and:

i. up to 25% of the stream flow for waters classified exceptional state waters, or designated special aquatic life use waters, and all recreational use waters, as calculated by a mixing zone modeling system, such as, CORMIX-GI v4.2, or higher, or any other equivalent model as determined by the Secretary.

A maximum 25% mixing zone will be applied to recreational criteria (fecal coliform bacteria) regardless of the aquatic life or other use designation.

ii. up to 50% of the stream flow for waters designated as expected aquatic life use waters, as calculated by a mixing zone modeling system, such as, CORMIX-GI v4.2, or higher, or any other equivalent model as determined by the Secretary.

iii. up to 100% if the stream flow for waters designated as restricted aquatic life use waters, as calculated by a mixing zone modeling system, such as, CORMIX-GI v4.2, or higher, or any other equivalent model as determined by the Secretary.

iv. In cases where surface waters with existing discharges are classified as Outstanding National Resource Waters, mixing zones will be allowed for those existing discharges for the term of the existing permit. No new discharges will be allowed after the reclassification. At the time of permit renewal or modification for an existing discharge permit, the mixing zone allocation for the existing discharge will be evaluated and the percentage of cross-sectional area or flow may be reduced or eliminated based on the new ONRW classification. The mixing zone evaluation will use available stream data, historical plant data, receiving stream and plant flows, and aquatic community health to determine whether a mixing zone and its size will be allowed in the renewed or modified permit.

In all cases, the implementation of the above mixing zone requirements, the mixing zone can be modified based on the proximity of downstream public drinking water intakes, swimming areas, boat ramp areas and mouths of classified stream segments as well as the overlapping of mixing zones, or when using best professional judgement significant environmental impact or public health concerns are noted from the unmixed effluent. In these situations, the mixing zone will be reduced.

Mixing zones may also be modified based on the use of alternate low flows, or studies which support the use of a modified mixing zone which may incorporate methods outlined in EPA’s Technical Support Document for Water Quality-based Toxics Control.

A zone of initial dilution (ZID) contained within the boundaries of the mixing zone may be granted for some discharges. The ZID can comprise no more than 10% of the volume of the mixing zone immediately below the discharge point. The zone of initial dilution is the area within the mixing where both acute and chronic aquatic life criteria may be legally exceeded. Where mixing zones are not allowed, a zone of initial dilution is prohibited. The Department also reserves the right to prohibit a zone of initial dilution, based on site-specific conditions, where a mixing zone has been granted.

b. Lakes
Applicable Regulation: 28-16-28c(b) (11)

Mixing zones within lakes classified as outstanding national resource waters, in K.A.R. 28-16-28b (pp), exceptional state waters, in K.A.R. 28-16-28b (y) or designated as special aquatic life use waters in K.A.R. 28-16-28d are prohibited by KDHE. Although mixing zones may be permitted in other classified lakes (expected or restricted aquatic life use waters), KDHE will require permit applicants to comply with the physical limitations for mixing zones set forth in K.A.R. 28-16-28c(b)(11). Evidence obtained through field studies, dispersion modeling analyses or other appropriate methods will be considered by KDHE during the permitting procedure.

Whenever possible, estimates of lake volume at conservation pool will be based on data provided by the official lake planning or administrative authority (e.g., U.S. Army Corps of Engineers, Bureau of Reclamation, Natural Resources Conservation Service, Kansas Department of Wildlife and Parks). When lake volumetric data unavailable or of questionable accuracy, the permit applicant will be encouraged to conduct appropriate morphometric and hydrological surveys to provide KDHE with a scientifically defensible estimate of conservation pool volume. A mixing zone within a classified lake will not exceed more than one percent of the lake conservation pool volume.

c. Wetlands
Applicable Regulation: 28-16-28c(b)(13)

Mixing zones within classified lacustrine or palustrine wetlands are prohibited by KDHE owing to the relatively slow circulation and limited mixing of these waters. At a minimum, effluent discharged into a classified wetland must meet all applicable aquatic life support, water supply, food procurement, and recreational criteria prior to contact with the receiving water unless the wetlands are utilized as part of a wastewater treatment process, or where site specific criteria apply.

d. Ponds
Applicable Regulation: 28-16-28c(b)(12)

Mixing zones within classified ponds are prohibited by KDHE.

5. Permit Limit Derivation
Applicable Regulations: K.A.R. 28-16-28c
K.A.R. 28-16-28d
K.A.R. 28-16-28e
K.A.R. 28-16-28g

a. Disinfection

In areas of downstream high population density (urban streams), KDHE will use best professional judgement, limits based on best available technology, and the authority of Kansas Statute 65-171(d) and K.A.R. 28-16-28c(d)(2) to routinely require continuous (year-round) disinfection for public health protection.
In surface waters where downstream primary contact recreation is the designated use, or in urban streams, the discharger shall be required to meet a fecal coliform geometric mean concentration of 200 colony forming units (CFUs) per 100 milliliters (mL) from Apirl 1st to October 31st and 2000 CFUs per 100 mL from November 1st to March 31st at the end-of-pipe .

When developing permit limits requiring disinfection for waters designated as primary or secondary contact recreational use, the Department will take into consideration receiving stream dilution, upstream fecal coliform counts, and fecal die-off where public health would not typically be compromised.

Where chlorine or any other halogen is used as the disinfectant, dechlorination (dehalogenation) will be required. In some cases, the water quality-based effluent limitations for chlorine are not quantifiable using EPA approved analytical methods. KDHE has determined the current acceptable quantification level for total residual chlorine in treated wastewater to be 100 ug/l. The permitee will conduct the analyses in accordance with the method specified and will utilize a standard equivalent to the minimum detection level. For reporting purposes, actual analytical values will be reported. Measured values above the quantification limit or the permit limit, whichever is higher, will be considered violations of the permit. Values below the quantification limit will be considered to be in compliance with the permit limitation and as zero (0) when utilized in any subsequent calculations. The quantification threshold does not authorize the discharge of chlorine in excess of the water quality-based effluent limits stated in the permit.

b. Metals
Applicable regulation: K.A.R. 28-16-28g

Tables 1a and 1b of the referenced regulation provide instream water quality-based limits for certain metals based upon the surface water designated use categories. KDHE routinely conducts compliance monitoring studies on the effluent from discharging wastewater treatment facilities at a frequency based upon the size and nature of the wastewater treatment facility, the type of industrial contributors to the facility and the characteristics and designated uses of the receiving stream. Major discharging wastewater treatment facilities (>1 MGD) and minor discharging wastewater treatment facilities (<1 MGD) with pretreatment contributors are generally monitored once a year. Part of this compliance monitoring involves determining the concentrations of the pollutant metals listed in Table 1a in the wastewater treatment plant effluents.

Upon request, or during the permit renewal period, the KDHE will calculate an allowable concentration in the wastewater treatment facility effluent for each of the metals listed in Appendix B. Permit limits will be expressed as Total Recoverable Metals.

Parameters are:

i. Metal Limits in the receiving stream: Use the data in K.A.R. 28-16-28g, Table 1a or the equations in Table 1b as appropriate.

ii. Hardness (as CaCO3): Use the 90 th percentile stream values as measured. If insufficient, use data from similar streams and near the subject location.

iii. Stream Flow: Use critical low flow.

iv. Effluent Flow: Use design flow from the NPDES permit, or flow as requested on the permit application.

v. Receiving Stream Background Metals Data: Use the 50^{th} percentile of measured stream values. Use zero for all values reported below the minimum detection limit.

vi Effluent Metals Data: Use measured data. Use zero on all values reported below the minimum detection limit.

The effluent metals limits as calculated are compared with metal concentrations determined during compliance monitoring using the Reasonable Potential procedure discussed in Appendix C.

c. Five-day Biochemical Oxygen Demand (BOD_5)
Applicable regulation: K.A.R. K.A.R. 28-16-28g table 1g

Five-day Biochemical Oxygen Demand (BOD_5) is calculated utilizing a modified Streeter-Phelps equation. The calculations are performed in an iterative manner until the effluent BOD_5 of a discharge produces an in-stream reduction of dissolved oxygen concentration of not less than 5.0mg/l.

d. Ammonia
Applicable regulation: K.A.R. 28-16-28g table 1c, 1d, 1e, and 1f

Chronic and acute ammonia criteria will be determined using the instream pH below the chronic mixing zone after complete mixing with the wastewater effluent has occurred. Average monthly instream temperatures will also be used to determine chronic and acute ammonia criteria.

In accordance with EPA's *1999 Update of Ambient Water Quality Criteria for Ammoni*a, the Department has determined that early life stages (ELS) absent criteria, provided in Table 1e. of Appendix B, can be routinely applied on an ecoregional and seasonal basis in Kansas. Early life stages of fish species are not expected to occur in Kansas surface waters during the months of November through February for most parts of the State. Because early life stages are expected to occur in certain segments of the lower Kansas River and the Missouri River, ELS absent criteria will not be applied in those segments shown in Table 1f., of Appendix B.
Application of the ELS absent criteria outside of the months February through November, or in surface water segments listed in Table 1f., will require a site-specific literature and field examination of the fisheries community to establish the absence of early life stages. A thorough literature review for those fish species expected to occur in the surface water should be conducted to analyze historic fisheries information, expected spawning periods, spawning habitat requirements, residence times of early life stages, and other factors contributing to fish ELS absence. A thorough field examination of the fisheries community will also be required. A minimum of six seasonally based fish sampling events that includes the time of year where ELS absent criteria is being requested, will be required to establish the absence of ELS. Fish sampling methodologies, identification methodologies, and use of historic fisheries data must be approved by KDHE prior to initiating sampling.

e. Other parameters

Limitations for other pollutant parameters are developed utilizing steady state dilution modeling. For modeling purposes, actual background concentrations for the parameters in question are utilized where available.

6. Whole Effluent Toxicity

a. Species

Acute and chronic toxicity testing of discharges will use invertebrate and vertebrate species. Acute invertebrate toxicity testing will be conducted on any of the following daphnid species:

Daphnia Pulex
Daphnia magna
Ceriodaphnia dubia

Chronic invertebrate toxicity testing will be conducted on *Ceriodaphnia dubia* unless an alternate species is approved by KDHE.

Vertebrate toxicity testing will be conducted on the fathead minnow *Pimephales promela*s.

b. Acute toxicity

Procedures for toxicity testing will be in conformance with the EPA publication titled "Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms", fifth edition, October 2002. Monitoring and effluent limitations for acute toxicity, as defined under 28-16-28b(o), will be included in permits using the following criteria:

i. All KDHE-defined major discharging wastewater treatment facilities, except those facilities classified as majors because of non-contact cooling water, will be required to conduct, as a minimum, an annual acute toxicity monitoring test on a representative sample of the wastewater effluent. KDHE will utilize BPJ to determine if additional or more frequent toxicity testing is appropriate.

ii. KDHE will utilize best professional judgment to determine when other wastewater treatment facilities will be required to conduct acute toxicity monitoring. In this determination, KDHE will consider the size and type of industrial contributions to the wastewater system, previous toxicity testing results, the potential causes for the toxicity, the relative size and use designation of the receiving surface water body, and information from stream studies.

iii. Whenever results from two consecutive or any two of four consecutive acute toxicity tests indicate the effluent is more toxic than levels established in the permit, and the cause for the toxicity is not apparent, the permittee will be required to conduct at least quarterly acute toxicity tests for one year. Results from

KDHE labs, EPA labs, and KDHE certified labs are acceptable. If the results of additional toxicity tests indicate no acute toxicity at the edge of the zone of initial dilution, the testing frequency will be returned to previous levels. If acute toxicity continues, at least quarterly testing will continue and the permittee will be required to conduct a Toxicity Inventory Evaluation (TIE) in accordance with EPA guidance to attempt to determine the source and type of toxicity being discharged. KDHE may require a toxicity inventory evaluation at any time during the additional testing. The toxicity will need to be eliminated through a Toxicity Reduction Evaluation (TRE).

c. Chronic Toxicity

Procedures for chronic toxicity testing will be in conformance with the EPA publication titled "Short Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms", fourth edition, October 2002.

Monitoring and permit limit requirements for chronic toxicity, as defined under K.A.R. 28-16-28b(p), may be included in permits using the following criteria:

i. When the allowable median lethal concentration calculated at the edge of the zone of initial dilution exceeds 100%, a chronic toxicity test will be utilized. This situation can occur where the stream mixing zone dilution is small in comparison to the facility discharge volume.

ii. When significant environmental damage is determined through in-stream bioassessment procedures in a classified surface water flowing at or above low flow conditions as defined in K.A.R. 28-16-28c(c)(1), and the damages are believed to be caused by a wastewater discharge, even though no acute toxicity is detected in the wastewater effluent, a chronic toxicity test may be utilized.

iii. Whenever results from two consecutive or any two of four consecutive chronic toxicity tests indicate the effluent is more toxic than levels established in the permit, and the cause for the toxicity is not apparent, the permittee will be required to conduct at least quarterly chronic toxicity tests for one year. Results from KDHE labs, EPA labs, and KDHE certified labs are acceptable. If the results of additional toxicity tests indicate no chronic toxicity at the edge of the mixing zone, the testing frequency will be returned to previous levels. If chronic toxicity continues, at least quarterly testing will continue and the permittee will be required to conduct a Toxicity Inventory Evaluation (TIE) in accordance with EPA guidance to attempt to determine the source and type of toxicity being discharged. KDHE may require a toxicity inventory evaluation at any time during the additional testing. The toxicity will need to be eliminated through a Toxicity Reduction Evaluation (TRE).

D. Best Professional Judgement

For pollutants where there are no effluent guidelines, or where there are no water quality criteria, best professional judgment (BPJ) may be used in developing permit limitations.

II. Administrative Permit Issuance

A. Certification Procedure

Applicable regulation: K.A.R. 28-16-28f(c)

KDHE will issue a water quality certification for any actions taken by the department as described in K.A.R. 28-16-28f(c)(1) through (4).

For major wastewater treatment facilities required to have a federal license or permit pursuant to the federal clean water act, the department will certify the actions via the Fact Sheet and the permit. The Fact Sheet will contain the certification statement and summarize the supporting documents used to develop the permit limits and conditions. For minor wastewater treatment facilities required to have a federal license or permit pursuant to the federal clean water act, the department will certify the actions via the Statement of Basis form and the permit. The Statement of Basis form will contain the certification statement and summarize the supporting documents used to develop the permit limits and conditions.

For other minor treatment facilities required to have a State permit but not a federal license or permit, KDHE will certify the actions via a KDHE Review Checklist and a Kansas Water Pollution Control permit.

For other actions taken by the department as described in K.A.R. 28-16-28f(c)(1) through (4), KDHE will issue a water quality certification within the documents approving the action.

B. Parameter Monitoring, Limits, and Frequency

Applicable regulation: K.A.R. 28-16-28e
K.A.R. 28-16-28g

1. Parameter Monitoring

The Kansas Water Quality Standards (KWQS) provide a list of parameters with in-stream water quality limitations (criteria). In addition, the general narrative criteria state that surface waters will be free from the harmful effects of substances that originate from artificial sources of pollution and produce any public health hazard, nuisance condition, or impairment of designated use.

Many of the potential pollutants listed in the tables of the KWQS are used almost exclusively in specialized industries and are generally attributed to those industries. Other potential pollutants are easily volatilized, treated, chemically bound, or eliminated from the water. Still others, such as toxaphene and DDT, are banned from production and use and only "leftover" quantities appear infrequently in the influents to wastewater treatment facilities. Therefore, it is neither cost effective nor necessary to measure for every regulated parameter in the KWQS tables. KDHE places in each permit, requirements to monitor certain parameters based upon the likelihood that the parameters are present in concentrations, which exceed the KWQS criteria. KDHE may require pollutant scans and/or whole effluent toxicity testing to determine the presence of a class of pollutants or the overall effect of the effluent on aquatic life. KDHE will evaluate the type of service area and treatment plant, plant design flows and actual flows, the ratio of receiving a stream flow rate relative to the effluent flow rate, stream designated uses, pollutant characteristics, the industrial contribution, and the pre-treatment practices of the contributing industry, in determining if whole effluent toxicity testing or pollutant scan requirements are needed in the permit.

2. Parameter Limits

Parameter limits are generally set by technology-based criteria, categorical standards criteria, or Water Quality Standards criteria. The limits are based upon the receiving stream's designated uses, plant design flow, water quality assessment effluent flow, receiving stream flow, historical plant and receiving stream data, and employment of modeling formulas with these data. However, in an increasing number of cases, the permit limits, as calculated, are below the minimum detection limit (MDL) of the approved methods outlined in 40 CFR Part 136. In these cases, KDHE will place the limit, as calculated, in the permit with a notation similar to:

"* This limit is below the minimum quantification level of _____ (units) for this parameter using any suitable approved test method in 40 CFR Part 136. This requirement shall be satisfied by a measurement of _____ (units) or less when using (test method or instrument approved by 40 CFR Part 136). The quantification threshold does not authorize the discharge of (parameter) in excess of the water quality-based effluent limit stated in the permit."

3. Parameter Testing Frequency

The frequency for which a parameter is tested is dependent upon many factors such as the flow rate and type of treatment facility, the receiving stream designated uses, the receiving stream flow rate relative to the effluent flow rate, the toxicity and likely presence of the parameter, potential for episodic flows with higher than normal concentrations of the parameter, operating history of the facility, amount and quality of available data, amount and type of industrial contributors to the collection system. A suggested testing frequency follows:

Facility Flow Rate	**General Testing Frequency**
Quarries & Similar	Monthly to Semi-Annual
Small 120-Day Lagoons	Quarterly
Mechanical Plants and Large Lagoons	
>0 to 1.0 MGD	Monthly
1.0 to 2.5 MGD	Twice Monthly
2.5 to 10.0 MGD	Four Times Monthly
10.0 to 30.0 MGD	Twice Weekly
30.0 to 60.0 MGD	Three Times Weekly
60.0 MGD and above	Every Other Day

Suggested testing frequency is for routine parameters. The permit writer may use BPJ to appropriately increase or decrease the testing frequency as necessary to satisfy the regulatory requirements for each permit.

Testing frequency may also be increased or decreased based on historical performance of the treatment facilities.

C. Background Concentrations

Applicable regulation: K.A.R. 28-16-28b(e)
K.A.R. 28-16-28e (b)(9)
K.A.R. 28-16-28e (c)(3)(B)

In surface waters where naturally occurring concentrations of elemental substances such as chlorides or sulfates exceed the numeric criteria given in Tables 1a, 1b, and 1c in K.A.R. 28-16-28g, the newly established numeric criteria will be the background concentration in the receiving water. Background concentrations applied as criteria will be determined only for those substances incorporated into surface waters that are released from geologic deposits and formations as a result of erosional processes or groundwater intrusions. Once established, criteria based on background pollutant concentrations will be used to develop permit effluent limitations.

D. Compliance Schedules

Applicable regulation: K.A.R. 28-16-28f(d)

Compliance schedules are placed in permits when the permittee is unable to comply with water quality requirements or special conditions. Interim and final limits are placed in the permit with monitoring normally required for the parameters for which the compliance schedule was developed.

E. Narrative Criteria

Applicable regulation: K.A.R. 28-16-28e(b)

Narrative criteria are implemented through the application of permit limits for individual pollutants and Whole Effluent Toxicity testing for combinations or unidentified toxic substances. Narrative criteria are also implemented through standard language placed in NPDES permits.

F. Site-Specific Criteria

Applicable regulation: K.A.R. 28-16-28f(f)

A site-specific criteria determination can change the water quality aquatic life criteria for a parameter(s) in a given stream segment. A change in criteria based on a site-specific determination will not be granted to allow technology-based limits to be exceeded. Once site-specific criteria are adopted, they will be used to develop permit effluent limitations.

G. Variances

Applicable regulations: K.A.R. 28-16-28f(e)

A variance is a mechanism that allows a delay in compliance for the stream segment and specific water quality parameters for which the variance is granted. A variance does not change the receiving stream designations or the level of protection to be afforded the stream. A variance should only be requested when compliance with a water quality criteria will have substantial and widespread socioeconomic impact. A variance cannot be granted which would result in effluent limitations above technology-based limits. A variance is granted, at a maximum, for the time period of the NPDES permit. A variance allows effluent limitations for certain pollutants, and parameters above the water quality-based limitations necessary to satisfy the criteria set via K.A.R. 28-16-28e and K.A.R. 28-16-28g.

The person requesting a variance from the criteria set via K.A.R. 28-16-28e(c) must specifically state, in writing to KDHE, the parameter(s) for which a variance is being sought. The request must also include the scope, content, and time frame for a study justifying the variance. KDHE approval of the scope, content and time frame of the study is required. The study must be conducted by a person, or persons, skilled in developing the types of information required in a variance study. Such skills will include appropriate financial knowledge, engineering cost estimating, and user charge development.

The variance procedure shall follow the EPA Guidance Document titled “Interim Economic Guidance for Water Quality Standards, March 1995" (EPA-823-b-95-002).

The decision and appropriate permit modifications shall be public noticed and both the decision and the modified permit shall be subject to review and appeal. If the variance is not granted, the permit will be modified with a schedule of compliance.

H. Public Notice

Public notice and hearings on actions concerning these regulations shall be in accordance with K.A.R. 28-16-61. K.A.R. 28-16-61, among other things, adopts 40 CFR Part 124.10(c)(1)(i),(ii),(iii), and (iv) which requires notification of pertinent government agencies in regards to proposals for draft NPDES permits. KDHE sends copies of all public notice documents to all agencies identified in the Water Projects Environmental Coordination Act (K.S.A. 82a-326).

Public notice of state-wide concerns is published in the Kansas Register and major daily newspapers across the state. Regional and local issues are public noticed in the Kansas Register and regional and/or local daily and/or weekly newspapers based upon circulation of the newspaper and/or status as the official newspaper for the entity.

I. Permitting Issuance

The permitting process used by the Bureau of Water is shown in the flow schematic in Appendix D. The two primary categories of permits are the National Pollutant Discharge Elimination System (NPDES) permits which are joint federal/state permits for overflowing (discharging) facilities and Kansas Water Pollution Control permits which are Kansas-only permits for non-overflowing (total retention) facilities. Both types of permits are given state permit identification numbers. Only the joint federal/state permits have federal identification numbers. All wastewater treatment facility permit numbers are assigned by KDHE.

For federal/state facilities required to have a federal license or permit pursuant to the federal clean water act, the initiating KDHE section will request a water quality assessment from the appropriate KDHE section via the Water Quality Assessment form. Comments and data provided on, or with the WQA form, the available stream data, current regulations, and other applicable standards will be reviewed to determine appropriate parameters and limitations for the effluent from the wastewater treatment facility. The initiating section will review the calculated parameters and limitations and determine, based upon characteristics of the effluent, the parameters which are likely to be present and, if a Reasonable Potential to exceed the proposed limits exists. If the parameters have technology based or categorical limits or if Reasonable Potential exists, parameter limits will be placed in the permit. If Reasonable Potential does not exist, limits on that parameter will not be placed in the permit. If insufficient data is available to conduct a reliable Reasonable Potential calculation, monitoring for the parameter will be required. Such circumstances are discussed in the Reasonable Potential section of these Implementation Procedures.

After permits have gone through the approval process, they are dated (effective date and expiration date) and signed by the Secretary of the Kansas Department of Health and Environment.

Permits can be effective for up to five years. Permits are currently being assigned to expire in certain years, according to the drainage basin to which they discharge or, for a non-overflowing facility, where they are located. During this transition some permits may expire in two to four years instead of the normal five years. KDHE will conduct a basin-wide water quality study prior to the year during which the permits in that basin expire to determine if any of the monitored pollutants exceed the water quality standards criteria. If the water quality standards are exceeded and are caused by artificial sources, the sources will be identified and a wasteload allocation to each source (point and/or non-point) shall be assigned to reduce the pollutants, to meet the water quality standards.

The Department may also require a shorter permit effective time where pollutants of concern are expected but data is not adequate to determine Reasonable Potential and/or there is a need to upgrade the treatment process. In general, the effective and expiration dates shall be at or near the end or beginning of a month so as to avoid confusion when changes occur between the old and new permit. New permits on quarterly monitoring schedules shall be routinely assigned quarterly reporting months of April, July, October and January.

A flow schematic of the permitting process is included in Appendix D.

Appendix A

Lagoon Solids Limits

[6560-01-M]

ENVIRONMENTAL PROTECTION AGENCY

[FRL-1006-1]

SECONDARY TREATMENT INFORMATION REGULATION

Suspended Solids Limitations for Wastewater Treatment Ponds

On October 7, 1977, the Environmental Protection Agency (EPA) published in the FEDERAL REGISTER (42 FR 54666) a final amendment to the secondary treatment information regulation applicable to the suspended solids limitations for certain municipal wastewater treatment ponds. The secondary treatment information regulation, 40 CFR 133, contains effluent limitations in terms of biochemical oxygen demand, suspended solids and pH which must be achieved by municipal wastewater treatment plants.

The amendment added a new paragraph (c) to § 133.103 of 40 CFR 133. This allows a case-by-case adjustment in suspended solids limitations for publicly owned waste stabilization ponds, if: The pond has a design capacity of 2 million gallons per day or less; ponds are the sole process for secondary treatment; and, the pond meets the biochemical oxygen demand limitations as prescribed by 40 CFR 133.102(a). Ponds that are not eligible for this adjustment include: Basins or ponds used as a final polishing step for other secondary treatment systems, and ponds which include complete-mix aeration and sludge recycle or return since these systems are in essence a variation of the activated sludge process. Aerated ponds without sludge recycle, however, are eligible for adjustments provided the other specific requirements are met.

The amended suspended solids limitations were determined by statistical analysis of available data. The acceptable limit was defined as that concentration achieved 90 percent of the time by waste stabilization ponds that are achieving the biochemical oxygen demand limitations of 40 CFR 133.102(a). Each State was considered separately as well as appropriate contiguous geographic areas within a State or group of States. The analysis was done by the States or the applicable EPA regional office in cooperation with the States.

A considerable amount of latitude was allowed in developing these values to account for varying conditions affecting pond use and performance across the country. Categorizations within States based on factors such as geographic location, seasonal variation and the type of pond were permitted. In some instances, the values presented below reflect these factors.

In accordance with the amended regulation, a single value corresponding to the concentration achievable 90 percent of the time may be used to establish the suspended solids limitations for ponds within a State. The concentration achievable 90 percent of the time has been generally accepted as corresponding to a 30 consecutive day average (or an average value over the period of discharge when entire duration of the discharge is less than 30 days). This interpretation is consistent with the analysis which was used as the basis for the other suspended solids and biochemical oxygen demand limitations contained in 40 CFR 133.

For this reason, a single suspended solid concentration has been listed below for ponds (or subcategory of ponds) within a State. In some cases, however, the States and EPA regional offices have agreed upon additional values, such as weekly averages or daily maximums, which will be used for compliance monitoring purposes within those States.

In some cases the data base for the analysis was quite limited and in all cases additional data are being collected. A periodic reevaluation of this expanding data base will be conducted and could result in further changes in the suspended solids limitations listed below. Several EPA regional offices have already indicated their intent to conduct a reevaluation within 2 years or less. Even though publication of these values is not a formal rulemaking procedure, public comments are welcome and will be considered in any revisions. Comments should be submitted to Director, Municipal Construction Division (WH-547), Environmental Protection Agency, Washington, D.C. 20460.

FOR FURTHER INFORMATION CONTACT:

Sherwood Reed or Alan Hais, Municipal Construction Division (WH-547), Office of Water Program Operations, Environmental Protection Agency, Washington, D.C. 20460, 202-426-8976.

Dated October 27, 1978.

THOMAS C. JORLING,
Assistant Administrator for Water and Waste Management.

ENVIRONMENTAL PROTECTION AGENCY

SUSPENDED SOLIDS LIMITATIONS FOR WASTEWATER TREATMENT PONDS **

Location and Suspended Solids Limit (mg/l)

Alabama—90.
Alaska—70.
Arizona—90.
Arkansas—90.
California—95.
Colorado
Aerated ponds—75.
All others—105.
Connecticut—N.C.
Delaware—N.C.
District of Columbia—N.C.
Florida—N.C.
Georgia—90.
Guam—N.C.
Hawaii—N.C.
Idaho—N.C.
Illinois—37.
Indiana—70.
Iowa

Controlled Discharge, 3 Cell and Case-by-Case but not Greater Than 80

All others—80.
Kansas—80.
Kentucky—N.C.
Louisiana—90.
Maine—45.
Maryland—90.
Massachusetts—N.C.
Michigan
Controlled seasonal discharge
Summer—70.
Winter—40.
Minnesota—N.C.
Mississippi—90.
Missouri—80.
Montana—100.
Nebraska—80.
North Carolina—90.
North Dakota.
North and east of Missouri River—60.
South and west of Missouri River—100.
Nevada—90.
New Hampshire—45.
New Jersey—N.C.
New Mexico—90.
New York—70.
Ohio—65.
Oklahoma—90.
Oregon
East of Cascade Mountains—85.
West of Cascade Mountains—50.
Pennsylvania—N.C.
Puerto Rico—N.C.
Rhode Island—45.
South Carolina—90.
South Dakota—110.
Tennessee—100.
Texas—90.
Utah—N.C.
Vermont—55.
Virginia
East of Blue Ridge Mountains—60.
West of Blue Ridge Mountains—78.
Eastern Slope Counties: Loudoun, Fauqu Rappahannock, Madison, Green, Al marle, Nelson Amherst, Bedford, Fra lin, Patrick and, *Case-by-Case applical of 60/78 Limits*
Virgin Islands—N.C.
Washington—75.
West Virginia—80.
Wisconsin—60.
Wyoming—100.
Trust Territories and North Marianas—N

NOTE.—N.C.—No change from exist criteria.

[FR Doc. 78-32023 Filed 11-14-78; 8:45 a

** The values set for Iowa and Virginia incorporate a specific case-by-case provisions; however, in accordance with 40 CFR 133.133.103(c), adjustments of the suspended solids limitations for individual ponds in all States are to be authorized on a case-by-case basis.

Appendix B

State/Federal Numeric Water Quality Criteria

Table 1a. Aquatic Life, Agriculture, And Public Health Designated Uses Numeric Criteria.

	USE CATEGORY					
	AQUATIC LIFE		AGRICULTURE		PUBLIC HEALTH	
PARAMETER	ACUTE	CHRONIC	LIVESTOCK	IRRIGATION	FOOD PROCUREMENT	DOMESTIC WATER SUPPLY
RADIONUCLIDES (pCi/L)						
gross beta radioactivity	a	a	a	a	a	50
gross alpha particles including radium-226,but not radon or uranium	a	a	a	a	a	15
radium 226 and 228 combined	a	a	a	a	a	5
strontium 90	a	a	a	a	a	8
tritium	a	a	a	a	a	20,000
METALS (µg/L)						
antimony, total	88	30	a	a	640	6
arsenic, total	340	150	200	100	20.5	10
arsenic (III)	360	50	a	a	b	b
arsenic (V)	850	48	a	a	a	a
barium	a	a	a	a	a	1,000
beryllium, total	a	a	a	a	a	4
boron, total	a	a	5,000	750	a	a
cadmium, total	table 1b	table 1b	20	10	170	5
chromium, total	a	40	1,000	100	a	100
chromium (III)	table 1b	table 1b	a	a	3,433,000	50
chromium (VI)	16	11	a	a	3,400	50
copper, total	table 1b	table 1b	500	200	a	1,300
lead, total	table 1b	table 1b	100	5,000	a	15
mercury, total	1.4	0.77	10	a	0.146	b
nickel, total	table 1b	table 1b	500	200	4,600	610
selenium, total	20	5	50	20	4,200	170
selenium (V)	11.2	a	a	a	a	a
silver, total	table 1b	a	a	a	a	50
thallium, total	1,400	40	a	a	b	2
zinc, total	table 1b	table 1b	25,000	2,000	26,000	7,400
OTHER INORGANIC SUBSTANCES (µg/L)						
ammonia	table 1c	table 1c	a	a	a	a
asbestos (µfibers/L)	a	a	a	a	a	7,000,000
Chloride	860,000	c	a	a	a	250,000
chlorine, total residual	19	11	a	a	a	a
cyanide (free)	22	5.2	a	a	220,000	200
Fluoride	a	a	2,000	1,000	a	2,000
nitrate (as N)	a	a	a	a	a	10,000
nitrite + nitrate (as N)	a	a	100,000	a	a	10,000
phosphorus, elemental (white)	a	0.1	a	a	a	a

Table 1a. Aquatic Life, Agriculture, And Public Health Designated Uses Numeric Criteria (continued).

USE CATEGORY						
	AQUATIC LIFE		AGRICULTURE		PUBLIC HEALTH	
PARAMETER	ACUTE	CHRONIC	LIVESTOCK	IRRIGATION	FOOD PROCUREMENT	DOMESTIC WATER SUPPLY
sulfate	a	a	1,000,000	a	a	250,000
ORGANIC SUBSTANCES (µg/L)						
Benzenes.....................						
aminobenzene (analine)	14	6.7	a	a	a	a
benzene	5,300	a	a	a	51	5
chlorobenzene	250	50	a	a	1,600	130
dichlorobenzenes, total	1,120	763	a	a	2,600	a
o-dichlorobenzene	1,120	763	a	a	2,600	600
m-dichlorobenzene	1,120	763	a	a	960	b
p-dichlorobenzene	a	a	a	a	2,600	75
other chlorinated benzenes, total	250	50	a	a	a	a
1,2,4-trichlorobenzene	250	a	a	a	940	260
1,2,4,5-tetrachlorobenzene	250	50	a	a	1.1	0.97
pentachlorobenzene	250	50	a	a	1.5	1.4
hexachlorobenzene	6.0	3.7	a	a	0.00029	b
ethylbenzene	32,000	a	a	a	28,712	700
nitrobenzene	27,000	a	a	a	690	b
pentachloronitrobenzene	250	50	a	a	a	a
vinylbenzene (styrene)	a	a	a	a	a	100
Ethers................						
chloroalkyl ethers, total	238,000	a	a	a	a	a
bis(2-chloroethyl)ether	238,000	a	a	a	0.53	b
bis(2-chloroisopropyl)ether	238,000	a	a	a	65,000	b
bis(chloromethyl)ether	238,000	a	a	a	0.00029	0.00010
2-chloroethyl vinyl ether	360	120	a	a	a	a
halogenated ethers, total	360	122	a	a	a	a
chloromethyl methyl ether	238,000	a	a	a	0.00184	a
4,4'-dibromodiphenyl ether	360	120	a	a	a	a
hexabromodiphenyl ether	360	120	a	a	a	a
nonabromodiphenyl ether	360	120	a	a	a	a
pentabromodiphenyl ether	360	120	a	a	a	a
tetrabromodiphenyl ether	360	120	a	a	a	a
tribromodiphenyl ether	360	120	a	a	a	a
Halogenated Hydrocarbons........						
chlorinated ethanes						
1,2-dichloroethane	18,000	2,000	a	a	b	b
1,1,1-trichloroethane	18,000	a	a	a	173,077	200
1,1,2-trichloroethane	18,000	9,400	a	a	16	b
tetrachloroethanes, total	9,320	a	a	a	a	a
1,1,1,2-tetrachloroethane	9,320	a	a	a	a	a

Table 1a. Aquatic Life, Agriculture, And Public Health Designated Uses Numeric Criteria (continued).

USE CATEGORY						
	AQUATIC LIFE		AGRICULTURE		PUBLIC HEALTH	
PARAMETER	ACUTE	CHRONIC	LIVESTOCK	IRRIGATION	FOOD PROCUREMENT	DOMESTIC WATER SUPPLY
1,1,2,2-tetrachloroethane	9,320	2,400	a	a	3.3	b
pentachloroethane	7,240	1,100	a	a	a	a
hexachloroethane	980	540	a	a	3.3	b
chlorinated ethylenes, total	11,600	a	a	a	a	a
1,1-dichloroethylene	11,600	a	a	a	7,100	b
cis-1,2-dichloroethylene	11,600	a	a	a	a	70
trans-1,2-dichloroethylene	11,600	a	a	a	140,000	100
trichloroethylene	45,000	21,900	a	a	30	5
tetrachloroethylene	5,280	840	a	a	3.3	5
chlorinated propanes/propenes						
1,2-dichloropropane	23,000	5,700	9.0	a	15	0.50
1,3-dichloropropene	6,600	244	a	a	14.1	b
Other Halogenated Hydrocarbons.......						
halogenated methanes, total	11,000	a	a	a	15.7	100
bromomethane	11,000	a	a	a	1,500	b
1,2-dibromoethane	a	a	a	a	a	0.05
tribromomethane(bromoform)	11,000	a	a	a	140	b
bis(2-chloroethoxy)methane	11,000	a	a	a	15.7	a
bromodichloromethane	11,000	a	a	a	17	b
bromochloromethane	11,000	a	a	a	15.7	a
bromotrichloromethane	11,000	a	a	a	15.7	a
dibromochloromethane	11,000	a	a	a	13	b
dibromochloropropane	a	a	a	a	15.7	0.2
dibromodichloromethane	11,000	a	a	a	15.7	a
dichlorodifluoromethane	11,000	a	a	a	15.7	a
dichloromethane(methylene chloride)	11,000	a	a	a	590	4.7
trichloromethane(chloroform)	28,900	1,240	a	a	470	b
tribromochloromethane	11,000	a	a	a	15.7	a
trichlorofluoromethane	11,000	a	a	a	15.7	a
tetrachloromethane(carbon tetrachloride)	35,200	a	a	a	b	5
di(2-ethylhexyl)adipate	a	a	a	a	a	500
hexachlorobutadiene	90	9.3	a	a	18	b
hexachlorocyclopentadiene	7	5.2	a	a	206	50
vinyl chloride	a	a	a	a	525	2
Miscellaneous Organics............						
dioxin (2,3,7,8 TCDD)	0.01	0.00001	a	a	0.000000005	b
Isosphorone	117,000	a	a	a	b	b
polychlorinated biphenyls, total	2	0.014	a	a	0.000064	b
tributyltin oxide	0.149	0.026	a	a	a	a

Table 1a. Aquatic Life, Agriculture, And Public Health Designated Uses Numeric Criteria (continued).

	USE CATEGORY					
	AQUATIC LIFE		AGRICULTURE		PUBLIC HEALTH	
PARAMETER	ACUTE	CHRONIC	LIVESTOCK	IRRIGATION	FOOD PROCUREMENT	DOMESTIC WATER SUPPLY
Nitrogen Compounds...........						
nitrosamines, total	5,850	a	a	a	1.24	0.0008
N-nitrosodibutylamine	5,850	a	a	a	0.22	0.0063
N-nitrosodiethanolamine	5,850	a	a	a	1.24	a
N-nitrosodiethylamine	5,850	a	a	a	1.24	0.0008
N-nitrosodimethylamine	5,850	a	a	a	3.0	b
N-nitrosodiphenylamine	5,850	a	a	a	6.0	b
N-nitrosodi-n-propylamine	a	a	a	a	0.51	.005
N-nitrosopyrrolidine	5,850	a	a	a	34	0.016
acrylonitrile	7,550	2,600	a	a	0.25	b
benzidene	2,500	a	a	a	0.0002	b
3,3'-dichlorobenzidine	a	a	a	a	0.02	b
1,2-diphenyl hydrazine	270	a	a	a	0.20	b
Polynuclear Aromatic Hydrocarbons, total	a	a	a	a	0.0311	0.2
acenaphthene	1,700	520	a	a	990	670
acenaphthylene	a	a	a	a	0.0311	a
anthracene	a	a	a	a	40,000	b
benzo(a)anthracene	a	a	a	a	0.018	b
benzo(a)pyrene	a	a	a	a	0.018	b
benzo(b)fluoranthene	a	a	a	a	0.018	b
benzo(g,h,i)perylene	a	a	a	a	0.0311	a
benzo(k)fluoranthene	a	a	a	a	0.018	b
2-chloronaphthalene	a	a	a	a	1,600	1,000
chrysene	a	a	a	a	0.018	b
dibenzo(a,h)anthracene	a	a	a	a	0.018	b
fluoranthene	3,980	a	a	a	b	b
fluorene	a	a	a	a	5,300	b
ideno(1,2,3-cd)pyrene	a	a	a	a	0.018	b
naphthalene	2,300	620	a	a	a	a
phenanthrene	30	6.3	a	a	0.0311	a
pyrene	a	a	a	a	4,000	b
Phthalate Esters						
phthalates, total	940	3	a	a	a	a
butylbenzyl phthalate	a	a	a	a	1,900	1,500
di(2-ethylhexyl) phthalate	400	360	a	a	b	b
dibutyl phthalate	940	3	a	a	b	b
diethyl phthalate	a	a	a	a	b	17,000
dimethyl phthalate	940	3	a	a	1,100,000	b
Phenolic Compounds.........						
phenol	10,200	2,560	a	a	1,700,000	b
2,4-dimethyl phenol	1,300	530	a	a	850	380

Table 1a. Aquatic Life, Agriculture, And Public Health Designated Uses Numeric Criteria (continued).

	USE CATEGORY					
	AQUATIC LIFE		AGRICULTURE		PUBLIC HEALTH	
PARAMETER	ACUTE	CHRONIC	LIVESTOCK	IRRIGATION	FOOD PROCUREMENT	DOMESTIC WATER SUPPLY
chlorinated phenols						
2-chlorophenol	4,380	2,000	a	a	150	81
3-chlorophenol	a	a	a	a	29,000	a
2,4-dichlorophenol	2,020	365	a	a	b	b
2,4,5-trichlorophenol	100	63	a	a	3,600	1,800
2,4,6-trichlorophenol	a	970	a	a	2.4	b
pentachlorophenol	table 1b	table 1b	a	a	3.0	b
3-methyl-4-chlorophenol	30	a	a	a	a	a
nitrophenols, total	230	150	a	a	a	a
2,4-dinitrophenol	a	a	a	a	5,300	b
4,6-dinitro-o-cresol	a	a	a	a	280	b
Toluenes.................						
toluene	17,500	a	a	a	b	1,000
dinitrotoluenes, total	330	230	a	a	9.1	a
2,4-dinitrotoluene	330	230	a	a	3.4	b
xylene	a	a	a	a	a	10,000
PESTICIDES (µg/L)						
acrolein	68	21	a	a	290	190
acrylamide	a	a	a	a	a	0.01
alachlor (lasso)	760	76	100	a	a	2
aldicarb	a	a	a	a	a	3
aldicarb sulfone	a	a	a	a	a	2
aldicarb sulfoxide	a	a	a	a	a	3
aldrin	3	0.001	1	a	0.00005	b
atrazine (aatrex)	170	3	a	a	a	3
bromoxynil (MCPA)	a	a	20	a	a	a
carbaryl (sevin)	a	0.02	100	a	a	a
carbofuran (furadan)	a	a	100	a	a	40
chlordane	2.4	0.0043	3	a	0.00081	b
chlorpyrifos	0.083	0.041	100	a	a	a
2,4-D	a	a	a	a	a	100
dacthal (DCPA)	a	14,300	a	a	a	a
dalapon	a	110	a	a	a	200
diazinon (spectracide)	a	0.08	100	a	a	a
DDT and Metabolites........						
4,4'-DDE (p,p=-DDE)	1,050	a	a	a	0.00022	b
4,4'-DDD (p,p=-DDD)	a	a	a	a	0.00031	b
DDT, total	1.1	0.001	50	a	0.000024	b
dieldrin	0.24	0.056	1	a	0.000054	b
dinoseb (DNBP)	a	a	a	a	a	7
diquat	a	a	a	a	a	20
disulfoton (disyston)	a	a	100	a	a	a
endosulfan, total	0.22	0.056	a	a	159	b
alpha-endosulfan	0.22	0.056	a	a	89	62

Table 1a. Aquatic Life, Agriculture, And Public Health Designated Uses Numeric Criteria (continued).

	USE CATEGORY					
	AQUATIC LIFE		AGRICULTURE		PUBLIC HEALTH	
PARAMETER	ACUTE	CHRONIC	LIVESTOCK	IRRIGATION	FOOD PROCUREMENT	DOMESTIC WATER SUPPLY
beta-endosulfan	0.22	0.056	a	a	89	62
endosulfan sulfate	a	a	a	a	b	b
endothall	a	a	a	a	a	110
endrin	0.086	0.036	0.5	a	0.81	0.76
endrin aldehyde	a	a	a	a	0.30	b
epichlorohydrin	a	a	a	a	a	4
ethylene dibromide	a	a	a	a	a	0.05
fenchlorfos (ronnel)	a	a	100	a	a	a
glyphosate (roundup)	a	a	a	a	a	700
guthion	a	0.010	100	a	a	a
heptachlor	0.52	0.0038	0.1	a	0.000079	b
heptachlor epoxide	0.52	0.0038	0.1	a	b	b
hexachlorocyclohexane	100	a	a	a	0.0414	0.0123
alpha-HCH	100	a	a	a	0.0049	b
beta-HCH	100	a	a	a	b	b
delta-HCH	100	a	a	a	a	a
gamma-HCH (lindane)	0.95	0.08	5	a	0.0625	b
technical-HCH	a	a	a	a	0.0414	a
malathion	a	0.10	100	a	a	a
methoxychlor	a	0.03	1,000	a	a	40
methyl parathion	a	a	100	a	a	a
metribuzin (sencor)	a	100	a	a	a	a
mirex	a	0.001	a	a	0.000097	a
oxamyl (vydate)	a	0.001	a	a	a	200
parathion	0.065	0.013	100	a	a	a
picloram (tordon)	a	a	a	a	a	500
propachlor (ramrod)	a	8	a	a	a	a
simazine (princep)	a	a	10	a	a	4
toxaphene	0.73	0.0002	5	a	0.00028	b
2,4,5-T	a	a	2	a	a	a
2,4,5-TP (silvex)	a	a	a	a	a	10

a - criterion not available
b - US EPA has promulgated criterion for Kansas under the Code of Federal Regulations, Title 40, part 131.36
c - criterion under investigation

Table 1b. Hardness-Dependent Aquatic Life Support Criteria.

Formulae for calculation of hardness-dependent aquatic life support criteria for chromium III and total cadmium, total copper, total lead, total nickel, total silver and total zinc and pH-dependent aquatic life support criteria for pentachlorophenol. A WER value of 1.0 is applied in the hardness-dependent equations for total metals unless a site-specific WER has been determined and adopted by the department in accordance with K.A.R. 28-16-28e(a) and K.A.R. 28-16-28f(f). Hardness values in metal formulae are entered in units of mg/L as $CaCO_3$. Pentachlorophenol formulae apply only over the pH range 6.5-8.5.

CADMIUM (ug/L):
acute criterion = WER[EXP[(1.0166(LN(hardness)))-3.924]]
chronic criterion = WER[EXP[(0.7409(LN(hardness)))-4.719]]

CHROMIUM III (ug/L):
acute criterion = WER[EXP[(0.819*(LN(hardness)))+3.7256]]
chronic criterion = WER[EXP[(0.819*(LN(hardness)))+0.6848]]

COPPER (ug/L):
acute criterion = WER[EXP[(0.9422*(LN(hardness)))-1.700]]
chronic criterion = WER[EXP[(0.8545*(LN(hardness)))-1.702]]

LEAD (ug/L):
acute criterion = WER[EXP[(1.273*(LN(hardness)))-1.460]]
chronic criterion = WER[EXP[(1.273*(LN(hardness)))-4.705]]

NICKEL (ug/L):
acute criterion = WER[EXP[(0.846*(LN(hardness)))+2.255]]
chronic criterion = WER[EXP[(0.846*(LN(hardness)))+0.0584]]

PENTACHLOROPHENOL (ug/L):
acute criterion = EXP[(1.005*pH)-4.830]
chronic criterion = EXP[(1.005*pH)-5.290]

SILVER (ug/L):
acute criterion = WER[EXP[(1.72*(LN(hardness)))-6.59]]

ZINC (ug/L):
acute criterion = WER[EXP[(0.8473*(LN(hardness)))+0.884]]
chronic criterion = WER[EXP[(0.8473*(LN(hardness)))+0.884]]

Tab1e 1c. pH-Dependent Acute Aquatic Life Criteria For Total Ammonia.

Total ammonia as N, mg/L

ACUTE AQUATIC LIFE CRITERIA FOR AMMONIA, mg/L	
pH	CRITERIA
6.5	48.8
6.6	46.8
6.7	44.6
6.8	42.0
6.9	39.1
7.0	36.1
7.1	32.8
7.2	29.5
7.3	26.2
7.4	23.0
7.5	19.9
7.6	17.0
7.7	14.4
7.8	12.1
7.9	10.1
8.0	8.40
8.1	6.95
8.2	5.72
8.3	4.71
8.4	3.88
8.5	3.20
8.6	2.65
8.7	2.20
8.8	1.84
8.9	1.56
9.0	1.32

Tab1e 1d. pH- And Temperature-Dependent Chronic Aquatic Life Criteria For Total Ammonia Early Life Stages Of Fish Present.

Total ammonia as N, mg/L

CHRONIC AQUATIC LIFE CRITERIA FOR AMMONIA, EARLY LIFE STAGES PRESENT, mg/L										
pH	TEMPERATURE, °C									
	0	14	16	18	20	22	24	26	28	30
6.5	6.67	6.67	6.06	5.33	4.68	4.12	3.62	3.18	2.80	2.46
6.6	6.57	6.57	5.97	5.25	4.61	4.05	3.56	3.13	2.75	2.42
6.7	6.44	6.44	5.86	5.15	4.52	3.98	3.50	3.07	2.70	2.37
6.8	6.29	6.29	5.72	5.03	4.42	3.89	3.42	3.00	2.64	2.32
6.9	6.12	6.12	5.56	4.89	4.30	3.78	3.32	2.92	2.57	2.25
7.0	5.91	5.91	5.37	4.72	4.15	3.65	3.21	2.82	2.48	2.18
7.1	5.67	5.67	5.15	4.53	3.98	3.50	3.08	2.70	2.38	2.09
7.2	5.39	5.39	4.90	4.31	3.78	3.33	2.92	2.57	2.26	1.99
7.3	5.08	5.08	4.61	4.06	3.57	3.13	2.76	2.42	2.13	1.87
7.4	4.73	4.73	4.30	3.78	3.32	2.92	2.57	2.26	1.98	1.74
7.5	4.36	4.36	3.97	3.49	3.06	2.69	2.37	2.08	1.83	1.61
7.6	3.98	3.98	3.61	3.18	2.79	2.45	2.16	1.90	1.67	1.47
7.7	3.58	3.58	3.25	2.86	2.51	2.21	1.94	1.71	1.50	1.32
7.8	3.18	3.18	2.89	2.54	2.23	1.96	1.73	1.52	1.33	1.17
7.9	2.80	2.80	2.54	2.24	1.96	1.73	1.52	1.33	1.17	1.03
8.0	2.43	2.43	2.21	1.94	1.71	1.50	1.32	1.16	1.02	0.897
8.1	2.10	2.10	1.91	1.68	1.47	1.29	1.14	1.00	0.879	0.773
8.2	1.79	1.79	1.63	1.43	1.26	1.11	0.973	0.855	0.752	0.661
8.3	1.52	1.52	1.39	1.22	1.07	0.941	0.827	0.727	0.639	0.562
8.4	1.29	1.29	1.17	1.03	0.906	0.796	0.700	0.615	0.541	0.475
8.5	1.09	1.09	0.990	0.870	0.765	0.672	0.591	0.520	0.457	0.401
8.6	0.920	0.920	0.836	0.735	0.646	0.568	0.499	0.439	0.386	0.339
8.7	0.778	0.778	0.707	0.622	0.547	0.480	0.422	0.371	0.326	0.287
8.8	0.661	0.661	0.601	0.528	0.464	0.408	0.359	0.315	0.277	0.244
8.9	0.565	0.565	0.513	0.451	0.397	0.349	0.306	0.269	0.237	0.208
9.0	0.486	0.486	0.442	0.389	0.342	0.300	0.264	0.232	0.204	0.179

Table 1e. pH- And Temperature-Dependent Chronic Aquatic Life Criteria For Total Ammonia Early Life Stages Of Fish Absent.

Total ammonia as N, mg/L.

CHRONIC AQUATIC LIFE CRITERIA FOR AMMONIA, EARLY LIFE STAGES ABSENT*, mg/L								
pH	TEMPERATURE, °C							
	0-7	8	9	10	11	12	13	14**
6.5	10.8	10.1	9.51	8.92	8.36	7.84	7.35	6.89
6.6	10.7	9.99	9.37	8.79	8.24	7.72	7.24	6.79
6.7	10.5	9.81	9.20	8.62	8.08	7.58	7.11	6.66
6.8	10.2	9.58	8.98	8.42	7.90	7.40	6.94	6.51
6.9	9.93	9.31	8.73	8.19	7.68	7.20	6.75	6.33
7.0	9.60	9.00	8.43	7.91	7.41	6.95	6.52	6.11
7.1	9.20	8.63	8.09	7.58	7.11	6.67	6.25	5.86
7.2	8.75	8.20	7.69	7.21	6.76	6.34	5.94	5.57
7.3	8.24	7.73	7.25	6.79	6.37	5.97	5.60	5.25
7.4	7.69	7.21	6.76	6.33	5.94	5.57	5.22	4.89
7.5	7.09	6.64	6.23	5.84	5.48	5.13	4.81	4.51
7.6	6.46	6.05	5.67	5.32	4.99	4.68	4.38	4.11
7.7	5.81	5.45	5.11	4.79	4.49	4.21	3.95	3.70
7.8	5.17	4.84	4.54	4.26	3.99	3.74	3.51	3.29
7.9	4.54	4.26	3.99	3.74	3.51	3.29	3.09	2.89
8.0	3.95	3.70	3.47	3.26	3.05	2.86	2.68	2.52
8.1	3.41	3.19	2.99	2.81	2.63	2.47	2.31	2.17
8.2	2.91	2.73	2.56	2.40	2.25	2.11	1.98	1.85
8.3	2.47	2.32	2.18	2.04	1.91	1.79	1.68	1.58
8.4	2.09	1.96	1.84	1.73	1.62	1.52	1.42	1.33
8.5	1.77	1.66	1.55	1.46	1.37	1.28	1.20	1.13
8.6	1.49	1.40	1.31	1.23	1.15	1.08	1.01	0.951
8.7	1.26	1.18	1.11	1.04	0.976	0.915	0.858	0.805
8.8	1.07	1.01	0.944	0.885	0.829	0.778	0.729	0.684
8.9	0.917	0.860	0.806	0.456	0.709	0.664	0.623	0.584
9.0	0.790	0.740	0.694	0.651	0.610	0.572	0.536	0.503

*Early life stage absent criteria will apply to all Kansas surface waters during the months November through February except in surface water segments listed in Table 1f. The application of early life stage absent criteria outside of the months November through February shall require a segment-specific examination of the surface water for the presence of early life stages of fish.

** At 15 °C and above, the criterion for early life stages absent is equivalent to the criterion for early life stages present.

Table 1f. Surface Water Segments Where Early Life Stages Absent Chronic Aquatic Life Criteria Are Not Applicable.

SURFACE WATER	BASIN	SUBBASIN	HYDROLOGIC UNIT CODE	SEGMENT NUMBER
Kansas River	Kansas Lower Republican	Lower Kansas	10270104	1
Kansas River	Kansas Lower Republican	Lower Kansas	10270104	2
Kansas River	Kansas Lower Republican	Lower Kansas	10270104	3
Kansas River	Kansas Lower Republican	Lower Kansas	10270104	4
Kansas River	Kansas Lower Republican	Lower Kansas	10270104	5
Kansas River	Kansas Lower Republican	Lower Kansas	10270104	18
Kansas River	Kansas Lower Republican	Lower Kansas	10270104	19
Kansas River	Kansas Lower Republican	Lower Kansas	10270104	21 From Bowersock dam east to segment 19
Missouri River	Missouri	Tarkio-Wolf	10240005	1
Missouri River	Missouri	Tarkio-Wolf	10240005	2
Missouri River	Missouri	Tarkio-Wolf	10240005	19
Missouri River	Missouri	Tarkio-Wolf	10240005	20
Missouri River	Missouri	Tarkio-Wolf	10240005	21
Missouri River	Missouri	Independence-Sugar	10240011	1
Missouri River	Missouri	Independence-Sugar	10240011	2
Missouri River	Missouri	Independence-Sugar	10240011	4
Missouri River	Missouri	Independence-Sugar	10240011	5
Missouri River	Missouri	Independence-Sugar	10240011	7
Missouri River	Missouri	Independence-Sugar	10240011	9
Missouri River	Missouri	Independence-Sugar	10240011	11
Missouri River	Missouri	Independence-Sugar	10240011	13
Missouri River	Missouri	Independence-Sugar	10240011	15
Missouri River	Missouri	Independence-Sugar	10240011	19

Table 1g. Temperature, Dissolved Oxygen, And pH Numeric Aquatic Life Criteria.

AQUATIC LIFE USE	DISSOLVED OXYGEN (DO)	PH	TEMPERATURE
SPECIAL	5.0 mg/L[a]	6.5-8.5[b]	32°C[c]
EXPECTED	5.0 mg/L[a]	6.5-8.5[b]	32°C[c]
RESTRICTED	5.0 mg/L[a]	6.5-8.5[b]	32°C[c]

a - The concentration of dissolved oxygen in surface waters shall not be lowered by the influence of artificial sources of pollution.
b - pH range outside the zone of initial dilution.
c - Beyond the zone of initial dilution a discharge shall not elevate the temperature of a receiving surface water above this temperature, except as provided in paragraph (c)(2)(E)(ii).

Table 1h. Natural Background Concentrations.

BASIN	WATERBODY	HUC 8	SEGMENT	POLLUTANT	NATURAL BACKGROUND CONCENTRATION
Cimarron	Cimarron River	11040006	1; starting at state line and traveling upstream toward Hayne.	Chloride	1,010 mg/L
Cimarron	Crooked Creek	11040007	1 and 2; starting at state line and traveling upstream to Copeland	Chloride	1,200 mg/L
Cimarron	Stumpie Arroyo	11040007	1247	Chloride	1,200 mg/L
Cimarron	Spring Creek	11040007	3	Chloride	1,200 mg/L
Cimarron	Remuda Creek	11040007	4	Chloride	1,200 mg/L
Cimarron	Cimarron River	11040008	1, 5, 11; starting at confluence with Bluff Creek and traveling upstream to the Oklahoma border.	Sulfate	465 mg/L
Cimarron	Cimarron River	11040008	1, 5, 11; starting at confluence with Bluff Creek and traveling upstream to the Oklahoma border.	Chloride	900 mg/L
Cimarron	Bluff Creek	11040008	2 & 13; starting at confluence with the Cimarron River and traveling upstream toward Minneola.	Sulfate	350 mg/L
Kansas-Lower Republican	Buffalo Creek	10250017	29 and 37; starting at the confluence with Republican River and traveling upstream to Mankato	Chloride	590 mg/L
Kansas-Lower Republican	Upper Kansas River	10270701	1, 3, 4, 6 and 7; starting at the confluence with the Big Blue River and traveling upstream to Junction City	Chloride	275 mg/L
Lower Arkansas	Rattlesnake Creek	11030009	1; above the Little Salt Marsh in Quivira National Wildlife Refuge QNWR	Chloride	1,400 mg/L
Lower Arkansas	Rattlesnake Creek	11030009	1; below the Little Salt Marsh in QNWR	Chloride	3,660 mg/L
Lower Arkansas	Rattlesnake Creek	11030009	1; below the Little Salt Marsh in QNWR	Sulfate	455 mg/L
Lower Arkansas	Peace Creek	11030010	6; starting at the confluence with the Arkansas River and traveling upstream to Stafford.	Chloride	1,800 mg/L

Table 1h. Natural Background Concentrations (continued).

BASIN	WATERBODY	HUC 8	SEGMENT	POLLUTANT	NATURAL BACKGROUND CONCENTRATION
Lower Arkansas	Arkansas River	11030013	3, 9, 18; starting at the confluence with Ninnescah River and ending at the confluence with the Little Arkansas River.	Sulfate	350 mg/L
Lower Arkansas	Slate Creek WA Watershed	11030013	Conservation Pool: Area: 26 acres Maximum Depth: 0.3 meters	Chloride	27,590 mg/L
Lower Arkansas	Slate Creek WA Watershed	11030013	Conservation Pool: Area: 26 acres Maximum Depth: 0.3 meters	Sulfate	2,500 mg/L
Lower Arkansas	Salt Fork Arkansas River	11060002	4, 6, 8, 10, 11, 13, and 15; starting at Kansas/Oklahoma state line and traveling upstream to west-central Comanche County.	Chloride	305 mg/L
Lower Arkansas	Salt Fork Arkansas River	11060002	4, 6, 8, 10, 11, 13, and 15; starting at Kansas/Oklahoma stateline and traveling upstream to west-central Comanche County.	Sulfate	730 mg/L
Lower Arkansas	Mule Creek	11060002	7; starting at the confluence with the Salt Fork Arkansas River; Headwaters in South-Central Kiowa County.	Sulfate	310 mg/L
Lower Arkansas	Medicine Lodge River	11060003	2; starting at the Oklahoma border and traveling upstream toward the confluence with Elm Creek.	Sulfate	450 mg/L
Lower Arkansas	Medicine Lodge River	11060003	8; starting at the confluence with Turkey Creek; Headwaters near Greensburg, in Kiowa County.	Sulfate	300 mg/L
Lower Arkansas	North Branch, Medicine Lodge River	11060003	24	Sulfate	300 mg/L
Lower Arkansas	Thompson Creek	11060003	26	Sulfate	300 mg/L
Lower Arkansas	Otter Creek	11060003	25	Sulfate	300 mg/L
Lower Arkansas	Soldier Creek	11060003	27	Sulfate	300 mg/L
Neosho	Doyle Creek	11070202	21	Sulfate	370 mg/L
Neosho	South Cottonwood River	11070202	17 and 18	Sulfate	840 mg/L
Neosho	French Creek	11070202	16	Sulfate	1,045 mg/L
Neosho	Clear Creek	11070202	4 and 5	Sulfate	290 mg/L
Upper Arkansas	Arkansas River	11030001	1, 3, 5, 7 & 9 from stateline to small stream E of Garden City.	Sulfate	1,875 mg/L
Upper Arkansas	Arkansas River	11030003	1	Sulfate	350 mg/L
Upper Arkansas	Arkansas River	11030004	11	Sulfate	350 mg/L
Upper Arkansas	Arkansas River	11030004	10 and 6	Sulfate	550 mg/L
Upper Arkansas	Arkansas River	11030004	10; beginning at the confluence of Mulberry Creek in east-central Ford County and ending at the confluence with Coon Creek.	Fluoride	1.45 mg/L

Table 1h. Natural Background Concentrations (continued).

BASIN	WATERBODY	HUC 8	SEGMENT	POLLUTANT	NATURAL BACKGROUND CONCENTRATION
Upper Republican	South Fork Republican River	10250003	2 and 4 (S. Fk. Republican River) starting at the Kansas-Nebraska state line and traveling upstream to southwest Cheyenne County and the Kansas-Colorado stateline.	Fluoride	1.45 mg/L
Upper Republican	Big Timber Cr	10250003	61	Fluoride	1.45 mg/L
Upper Republican	Delay Cr	10250003	66	Fluoride	1.45 mg/L
Upper Republican	Hackberry Cr	10250003	3	Fluoride	1.45 mg/L
Upper Republican	Bluff Cr	10250003	70	Fluoride	1.45 mg/L
Upper Republican	Valley Cr	10250003	69	Fluoride	1.45 mg/L
Upper Republican	Spring Cr	10250003	67	Fluoride	1.45 mg/L
Upper Republican	Sand Cr	10250003	68	Fluoride	1.45 mg/L
Upper Republican	South Fork Republican River	10250003	6, 7 and 9 (S. Fk. Republican River) starting at the Kansas-Nebraska state line and traveling upstream to southwest Cheyenne County and the Kansas-Colorado stateline.	Fluoride	1.20 mg/L
Upper Republican	Drury Cr	10250003	60	Fluoride	1.20 mg/L
Upper Republican	Crosby Cr	10250003	72	Fluoride	1.20 mg/L
Upper Republican	Battle Cr	10250003	71	Fluoride	1.20 mg/L
Upper Republican	Cowpe Cr	10250003	8	Fluoride	1.20 mg/L
Walnut	Whitewater River	11030017	18, 19, 21, and 23	Sulfate	390 mg/L
Walnut	Whitewater River, West Branch	11030017	22	Sulfate	390 mg/L
Walnut	Whitewater River, East Branch	11030017	24 and 25	Sulfate	390 mg/L
Walnut	Whitewater Creek	11030017	34	Sulfate	390 mg/L
Walnut	Prairie Creek	11030017	35	Sulfate	390 mg/L
Walnut	Wildcat Creek	11030017	26	Sulfate	390 mg/L
Walnut	Sand Creek	11030017	29	Sulfate	390 mg/L

Table 1h. Natural Background Concentrations (continued).

BASIN	WATERBODY	HUC 8	SEGMENT	POLLUTANT	NATURAL BACKGROUND CONCENTRATION
Walnut	W. Wildcat Creek	11030017	28	Sulfate	390 mg/L
Walnut	Gypsum Creek	11030017	30	Sulfate	390 mg/L
Walnut	E. Br. Whitewater Creek	11030017	31	Sulfate	390 mg/L
Walnut	Walnut Creek	11030017	44	Sulfate	390 mg/L
Walnut	Fourmile Creek	11030017	20	Sulfate	390 mg/L
Walnut	Dry Creek	11030017	32	Sulfate	390 mg/L
Walnut	Henry Creek	11030017	33	Sulfate	390 mg/L
Walnut	Eightmile Creek	11030018	30	Sulfate	520 mg/L

Table 1i. *Escherichia coli* Criteria For Classified Stream Segments.

USE	Colony Forming Units (CFUs)/100mL	
PRIMARY CONTACT RECREATION	Geometric Mean April 1 – Oct. 31	Geometric Mean Nov. 1 – March 31
Class A	160	2358
Class B	262	2358
Class C	427	3843
SECONDARY CONTACT RECREATION	Geometric Mean Jan. 1 – Dec. 31	
Class a	2358	
Class b	3843	

Table 1j. *Escherichia coli* Criteria For Classified Surface Waters Other Than Classified Stream Segments.

USE	Colony Forming Units (CFUs)/100mL			
PRIMARY CONTACT RECREATION	Geometric Mean April 1 – Oct. 31	Geometric Mean Nov. 1 – March 31	**Single Sample Maximum** April 1 – Oct. 31	Single Sample Maximum Nov. 1 – March 31
Swimming Beach	160	800	732	3655
Public Access	262	1310	1198	6580
Restricted Access	427	2135	1950	9760
SECONDARY CONTACT RECREATION	Geometric Mean Jan. 1 – Dec. 31		Single Sample Maximum Jan. 1 – Dec. 31	
Public Access	2135		9760	
Restricted Access	2135		9760	

National Toxics Rule (NTR) Criteria footnoted in Table1a. Of K.A.R.28-16-28e with a "b"		
Parameter	**NTR Domestic H20 Supply (µg/l)**	**NTR Food Procurement (µg/l)**
arsenic, total	0.018	-
mercury, total	0.14	-
benzene	1.2	-
m-dichlorobenzene	400	-
hexachlorobenzene	0.00075	-
nitrobenzene	17	-
bis(2-chloroethyl)ether	0.031	-
bis(2-chloroisopropyl)ether	1,400	-
1,2-dichloroethane	0.38	99
1,1,2-trichloroethane	0.6	-
1,1,2,2-tetrachloroethane	0.17	-
hexachloroethane	1.9	-
1,1-dichloroethylene	0.057	-
trichloroethylene	2.7	-
tetrachloroethylene	0.8	-
1,3-dichloropropene	10	-
bromomethane	48	-
tribromomethane (bromoform)	4.3	-
bromodichloromethane (dichlorobromomethane)	0.27	-
dibromochloromethane (chlorodibromomethane)	0.41	-
trichloromethane (chloroform)	5.7	-
tetrachloromethane (carbon tetrachloride)	0.25	4.4
hexachlorobutadiene	0.44	-
dioxin (2,3,7,8)	0.000000013	-
isophorone	8.4	600
polychlorinated biphenyls, total (PCBs)	0.00004	-
N-nitrosodimethylamine	0.00069	-
N-nitrosodiphenylamine	5	16
acrylonitrile	0.059	-
benzidene	0.00012	-
3,3'-dichlorobenzidine	0.04	-
1,2-diphenyl hydrazine	0.04	0.54
anthracene	9,600	-
benzo(a)anthracene	0.0028	-

benzo(a)pyrene	0.0028	-
benzo(b)fluoranthene	0.0028	-
benzo(k)fluoranthene	0.0028	-
chrysene	0.0028	-
dibenzo(a,h)anthracene	0.0028	-
fluoranthene	300	370
flourene	1,300	-
ideno(1,2,3-cd)pyrene	0.0028	-
pyrene	960	-
di(2-ethylhexyl)phthalate	1.8	5.9
dibutyl phthalate (di-n-butyl phthalate)	2,700	12,000
diethyl phtalate	-	120,000
dimethyl phthalate	313,000	-
phenol	21,000	-
2,4-dichlorophenol	93	790
2,4,6-trichlorophenol	2.1	-
pentachlorophenol	0.28	-
2,4-dinitrophenol	70	-
4,6-dinitro-o-cresol	13.4	-
toluene	-	200,000
2,4-dinitrotoluene	0.11	-
aldrin	0.00013	-
chlordane	0.00057	-
4,4'DDE (p,p''-DDE)	0.00059	-
4,4'-DDD (p,p''-DDD)	0.00083	-
DDT, total	0.00059	-
dieldrin	0.00014	-
endosulfan, total	0.93	2
endosulfan sulfate	0.93	2
endrin	0.76	-
endrin aldehyde	0.76	-
heptachlor	0.00021	0.00021
heptachlor epoxide	0.0001	0.00011
alpha-HCH	0.0039	-
beta-HCH	0.014	0.046
gamma-HCH (lindane)	0.019	-
toxaphene	0.00073	-

Appendix C
Reasonable Potential Methodology

Determining Reasonable Potential

Kansas has adopted a procedure, developed by EPA Region VI, to extrapolate limited data sets to better evaluate the potential for the higher effluent concentrations to exceed the State's water quality standard. The method yields an estimate of a selected upper percentile value. The most statistically valid estimate of an upper percentile value is a maximum likelihood estimator which is proportional to the population geometric mean. If one assumes the population of effluent concentrations to fit a lognormal distribution, this relationship is given by:

Cp =Cmean * exp (Zp * s - 0.5 * s 2)

where: Zp = normal distribution factor at p th percentile

s 2 = ln (CV 2 + 1)

To calculate the maximum likelihood estimator of the 95 th percentile, the specific relationship becomes:

C95 = Cmean * exp (1.646 * s - 0.5 * s 2)

if CV is assumed = 0.6, then s 2 = 0.307.

The ratio of the estimated 95 th percentile value to the mean (C95/Cmean) is calculated:

C95/Cmean = 2.13

A single effluent value or the geomentric mean of a group of values is multiplied by the ratio to yield the estimate of the 95 th percentile value.

The following table shows the ratio of the upper percentile to the mean for the 90 th , 95 th , and 99 th percentiles

Ratio of Upper Percentiles to Geometric Mean

Percentile	Z	Cp/Cmean
90	1.283	1.74
95	1.645	2.13
99	2.386	3.11

EXAMPLE FOR DETERMINING REASONABLE POTENTIAL

The outcome of this approach is illustrated in the following example:

Assume a discharger has reported 3 effluent concentrations of cadmium [9Fg/l, 12µg/l, and 15µg/l]. The discharge flow is 3 MGD, the receiving stream critical flow is 6.4 MGD. The ambient chronic standard for cadmium is 6µg/l as total metal. Assume 100% mix at the point of discharge and that the upstream concentration of cadmium is nondetectable. Evaluate the potential of the discharge to exceed water quality standards by assessing the impact of the 95 th percentile effluent cadmium concentration.

1. Estimations of 95 th percentile (regional approach)

The geometric mean effluent concentration of 12 µg/l is used as a parameter to estimate the 95 th percentile value, assuming a lognormal distribution and a coefficient of variation of 0.6.

C95 = Cmean * exp (1.283 * s - o.5 * s 2)

s 2 = ln (CV 2 +1)

C95 = Cmean = 2.13

12µg/l * 2.13 = 25.6µg/l

The 95 th percentile effluent value is used to calculate the Instream Waste Concentration:

2. Determination of Instream Waste Concentration

Cd = [(Qr * Ca) + (Qe * Ce)]/ (Qr + Qe)

where
Cd = ambient concentration of cadmium after mix (Instream Waste Concentration)
Qr = river flow
Qe = effluent flow
Ca = upstream concentration of cadmium
Ce = maximum effluent concentration of cadmium
Cd = [(6.4 * 0) + (3MGD * 26 µg/l)]/(6.4 MGD + 3 MGD)
= 8.2 µg/l

The Instream Waste Concentration of 8.2 Fg/l exceeds the ambient standard of 6.0 Fg/l, a limit would be placed in the permit.

Use of other Upper Percentiles

The 90 th percentile effluent value would be estimated as follows:

12 µg/l * 1.74 = 21 µg/l cadmium

The Instream Waste Concentration would be calculated:

[(6.4 *0) + (3MGD * 21 Fg/l)]/(6.4 MGD + 3 MGD)

= 6.6 µg/l cadmium

The 99 th percentile effluent value would be estimated as follows:

12 Fg/l * 3.11 = 37 µg/l cadmium

The Instream Waste Concentration would be calculated:

[(6.4 *0) + (3MGD * 37 μg/l)]/(6.4 MGD + 3 MGD)

= 12 μg/l cadmium

As one selects more extreme tail values at which to evaluate potential water quality exceedances, the reported effluent concentrations must decrease to conclude that the potential to exceed the standard is not present.

Dealing with Highly Variable Data Sets

The example above assumes that the coefficient of variation, defined as the ratio of the standard deviation to the mean is 0.6. If multiple effluent concentrations are reported which exhibit a large range between the highest and lowest values, the statistical variance of this population of numbers may well be greater than 0.6.

The geometric mean of a group of numbers can be calculated as follows:

1. Take the logarithm of each pollutant value.

2. Sum the logarithmically transformed values.

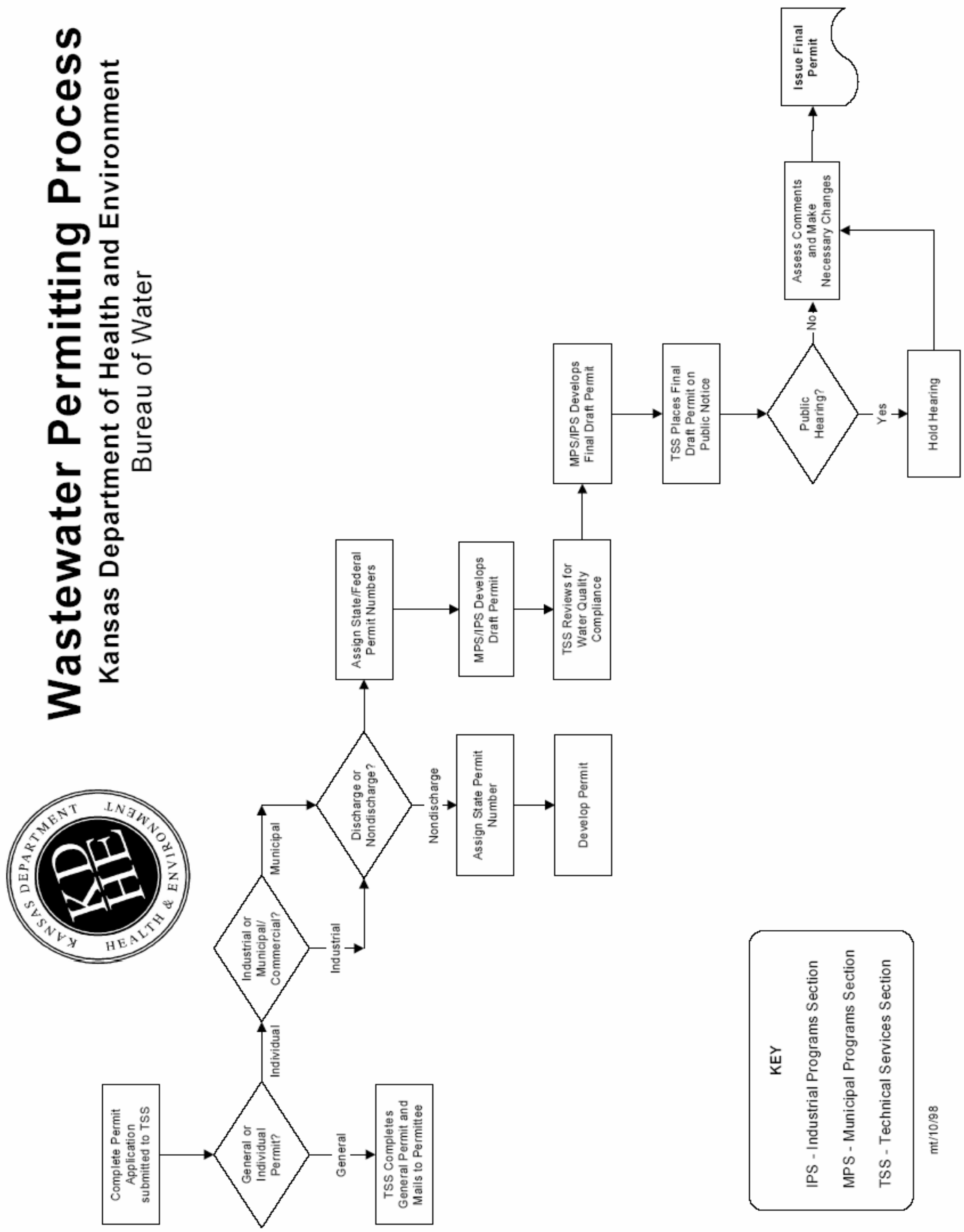
3. Divide the sum of transformed data by the number of measurements.

4. Express the geometric mean pollutant value by determining the antilog of the average of the logarithmically transformed values.

Dealing with Large Data Sets

When a larger data set of pollutant measurements is available, one may not need to statistically estimate the upper range or 95th percentile as described above. It is suggested that the 95th percentile be determined from the data and compared to the statistical estimation, the larger of these values should be assumed as the reasonably potential concentration of the discharge.

Appendix D
Permitting Process


Wastewater Permitting Process
Kansas Department of Health and Environment
Bureau of Water
Complete Permit Application submitted to TSS
General or Individual Permit?
General
TSS Completes General Permit and Mails to Permittee
Individual
Industrial or Municipal/ Commercial?
Industrial
Municipal
Discharge or Nondischarge?
Nondischarge
Assign State Permit Number
Develop Permit
Assign State/Federal Permit Numbers
MPS/IPS Develops Draft Permit
TSS Reviews for Water Quality Compliance
MPS/IPS Develops Final Draft Permit
TSS Places Final Draft Permit on Public Notice
Public Hearing?
Yes
Hold Hearing
No
Assess Comments and Make Necessary Changes
Issue Final Permit
KEY
IPS - Industrial Programs Section
MPS - Municipal Programs Section
TSS - Technical Services Section
mt/10/98